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Seismologist says earthquakes are preventable with proper monitoring

- Dallas Business Journal

Seismologist [William Ellsworth](#) said it's no surprise when earthquakes occur near waste-water injection wells but there are steps the federal government and oil and gas industry could take to prevent or reduce the severity of the quakes.

"It is possible to induce earthquakes that wouldn't otherwise occur. This is something we have known since the 1960s," said Ellsworth, who works at the U.S. Geological Survey's Earthquake Science Center in Menlo Park, Calif.

Earthquakes have become a way of life for residents in Azle and surrounding communities as more than 30 seismic events have occurred in recent months. Texas Railroad Commissioner [David Porter](#) hosted a town hall meeting in January that [drew hundreds to Azle High School to tell their stories and demand answers](#). When residents didn't get answers, anti-drilling groups [bused to Austin so they could testify in front of the commissioners](#), who regulate oil and gas in the state.

The commission responded by saying it would [hire a seismologist to work with various groups studying the issue](#). According to the job posting, the position will pay between \$5,000 to \$8,000 a month.

When drillers frack, they inject millions of gallons of water into the well along with chemicals to fracture the shale and prop open the tiny cracks with sand, hence why it's called a "proppant" by the industry.

That mixture of fluid returns to the surface along with the hydrocarbons, oil or natural gas. The frack fluid is separated and hauled away from the drill site to either be disposed of in injection wells or, in some cases, recycled for re-use.

While the fracking process itself might cause micro quakes, it's the disposal wells that are culprit for the spike in noticeable seismic activity, according to Ellsworth's research titled "Injection-Induced Earthquakes."

These injection wells are a critical cog in the hydraulic fracturing process, which has made the U.S. a worldwide energy leader, and talk of a link to earthquakes has also sent tremors through the industry.

Ellsworth says there are steps the industry could take to prevent or at least reduce the likelihood of earthquakes.

The key is to monitor pressures deep below the surface and set a limit that triggers a reduction in injection rates or suspension of activity.

“From a scientific standpoint, measuring the initial stress state and pore pressure, tracking of injection history and careful seismic monitoring would be of great value,” Ellsworth wrote in his report. “At present, little more is required by regulation than an estimate of the fracture pressure (not to be exceeded) and monthly reporting of total injection volume and average injection pressure. In most cases this information is not sufficient to apply the effective stress model or gain an understanding of the hazard posed by injection activity.”

I also asked him what happens if you stop injecting into the disposal wells, as many in the Azle area are calling for.

When disposal wells are shut in, the results aren’t always instantaneous.

“Sometimes the shut down of the well can quickly stop the earthquakes,” he said, referencing a case in Youngstown, Ohio where there were more than 100 quakes. “It might take more time to establish a cause and effect relationship. If they are involved, it will take time for pressure changes at the wells to percolate through the earth to where the earthquakes are occurring.”

Sometimes, the earthquake occurs miles from the injection well site or even a decade after injection activities have stopped. He cites the large 5.6 magnitude quake in Oklahoma as proof.

“Pore-pressure changes in a fault kilometers from the injection point depend on the hydrologic characteristics of the connecting pathways that will, in all likelihood, be poorly known.”

Residents in the Azle area report hearing loud boom sounds like a bomb going off when these quakes occur. What makes these different?

Beyond the fact that they’re potentially man made, the earthquakes themselves aren’t any different.

“They look like the earthquakes we see and record any place in the world,” Ellsworth said.

The smaller and shallower the earthquake, the louder the boom sound will be to human ears. Also, the closer you are to the epicenter, the louder it is.

“You need to be close enough that the intensity of the seismic wave is high enough to be able to reach human perception,” Ellsworth said. “Human hearing is only good to about 20 cycles per second. Largest earthquakes will be lower frequency.”